SHEET DISCHARGING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a sheet discharging apparatus used in a printer processor, an automatic development system, an image recording equipment and the like, and particularly to a sheet discharging apparatus for discharging recording sheets arranged in zigzag among rows so as to align in one row.

2. Description Related to the Prior Art

In a printer processor used in a photolaboratory is used a paper roll in which a continuous photosensitive recording paper is rolled. The photosensitive recording paper which is advanced from the paper roll is cut into recording sheets, and each recording paper is exposed so as to form an image. In the printer processor, thereafter, the recording sheet is conveyed to a development device in which the development and the fixation are made and a dryer in which the drying is made. As the recording sheet, there are a photosensitive recording sheet, normal paper sheet, and the like. And the recording sheet is simply called a sheet.

Compared with the exposing treatment for exposing and recording the image, a long time period is necessary to perform the developing treatment of one sheet, since during the developing treatment the sheet is conveyed through processing tanks which respectively contain water and processing liquids for color development, bleaching, fixation, wash, and stabilization. Accordingly, before the developing treatment in the pressing device or development/fixation device, plural exposed sheets are dispensed so as to lie in zigzag among the

plural rows in the conveying path such that the sheet of the latter exposure may be positioned behind that of the former exposure. Then the exposed sheets are conveyed to the development/fixation device. As the development is made after the zigzag arrangement of the sheets in plural rows on the conveying path, the facility of the treatment becomes larger in the same treatment period. Further, the sheet after the developing treatment is conveyed in the plural rows, and supplied in the dryer. In the dryer, an air heated by a heater is blown with fans so as to dry the sheet.

Otherwise, after the developing treatment and the drying treatment, the sheets discharged in plural rows as described above are gathered into a dispenser with the arrangement in a single row of the sheets in the order of the exposure. For example, Japanese Patents No. 3286598 (Pages 1-2), 2812143 (Pages 1-2), and Japanese Patent Laid-Open Publication No. 2000-3018 (Pages 2-4) describe sheet discharging apparatuses, in each of which the sheets conveyed in the plural rows are discharged and arranged in a single row in the order of the exposure.

In the sheet discharging apparatus described in the above three publications and the Japanese Patent Publication No. 60-23343, there are a conveying section for conveying the plural sheets arranged in plural rows in the conveying path, a discharging means for discharging out at a high speed the sheets which are conveyed in the plural rows, and a conveyer whose endless belt continuously shifts in a direction perpendicular to the discharging direction of the discharging means and receives the sheets discharged by the discharging means. When the sheets are discharged onto the belt, they reach sequentially in the order of the exposure, and therefore they are conveyed on the endless belt in the single row.

In such sheet discharging apparatus, when the sheet is discharged at a high speed to the endless belt by the discharging means, the rear edge or upstream edge of the sheet is nipped by a roller pair for conveying the sheet in the plural rows, and there is a difference between the conveying speed of the roller pair and the discharging speed of the discharging means. Accordingly, in order to discharge at high speed to the endless belt, it is necessary to eliminate for the difference. In the above publications No. 3286598 and 2812143, the sheet discharging apparatus is provided with a one-way clutch between a conveyer roller of the roller pair disposed along the plural rows and a shaft for coaxially supporting the conveyer rollers. When the discharging at the high speed to the endless belt is performed, the one-way clutch effects to release the conveyer roller from the driving system. Thus the conveyer roller freely rotates such that the sheet may smoothly leave the roller pair.

However, in order to eliminate for the difference between the conveying speed of the conveying roller and the discharging speed by the discharging means in this structure of free rotation of the conveying roller in effect of the one-way clutch, the large number of the one-way clutch is provided in accordance with the length variation of the cut sheet to be used in the above sheet discharging apparatus. As the one-way clutch is expensive, the low cost for production is difficult. Further, when a bending moment is biased to a roller shaft, the one-way clutch is easily broken. In order to prevent the break of the one-way clutch, the diameter of the roller shaft is so large that the bend of the roller shaft may have no influence on the one-way clutch, and otherwise a shaft bearing is provided to support both side ends of the roller shaft against radial load of the side ends. Accordingly, the cost becomes higher.

In the publication No. 2000-3018, a high-speed discharging roller pair constructing a high speed discharging means is constructed of a drive roller and a free roller (pinch roller). As the free roller can slip on the drive roller, the difference of the speed is eliminated. However, in this case, when the sheet is discharged, the free roller slips on the sheet. Accordingly, the photosensitive compounds on the sheet is rub out off and adhere to the rollers, and otherwise the compounds of the development solution adhere to the free roller. Therefore, it is necessary to often make the cleaning and the maintenance of the roller. Furthermore, as the free roller slips on the sheet, the abrasion of the surface of the free roller can occur. Accordingly, when the recording paper is discharged to the endless belt, a high speed discharging roller pair often cannot nip the sheet with a uniform nip force. Further, when the free roller slips on the sheet, the sheet is often damaged with scratch or the like. The damage of the surface for forming an image makes the quality of the sheet extremely lower. Furthermore, a clutch mechanism which is constructed of a solenoid and a pair of clutch plates may be used as in the publication No.60-23343, and a torque limiter mechanism may be used as in the publication No. 2765652. In these cases, however, the number of the parts becomes larger, and many controlling means are necessary, which prevents the decrease of the cost.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a sheet discharging apparatus for discharging out a sheet at a high speed with a discharging device, while the sheet is smoothly discharged without a one-way clutch, for eliminating a difference between a conveying speed in a conveying path and

a discharging speed with the discharging device.

Another object of the present invention is to provide a sheet discharging apparatus in which it is prevented that the sheet is scratched, and the maintenance of a roller is easy.

Still another object of the present invention is to provide a sheet discharging apparatus whose maintenance and structure is simple.

In order to achieve the object and the other object, a sheet discharging apparatus of the present invention includes a conveyor for conveying a sheet on a conveying path, a discharging device for discharging out the sheet, and a pushing device. The discharging device is positioned at an exit of the conveying path. When a rear end or upstream end of the sheet leaves the conveyor, a pushing device allows the discharging device to discharge the sheet by pushing the sheet toward the discharging device. The discharging speed of the discharging device is higher than a conveying speed of the conveyor.

The pushing device shifts between a push position and a retracting position. While the sheet is conveyed by the conveyor, the sheet pushes the pushing device to retract in the retracting position. When the sheet leaves the conveyor, the pushing device shifts back to a push position by effect of the gravity.

In a preferable embodiment, the pushing device has a swingable member and a push roller attached to the swingable member. The discharging device has a drive roller, and the drive roller and the push roller nip and discharge the sheet. A middle of a periphery of the drive roller is retracted to have a curve.

Further, the conveyor is a conveying roller pair for nipping and conveying the sheet. One roller of the conveying roller pair is a protruding roller whose periphery has a protruding middle portion, and another roller is a retracting

roller whose periphery has a recess corresponding to the shape of the protruding roller. When nipped by the convey roller pair, the sheet is curled to increase the rigidity.

According to the sheet discharging apparatus of the present invention, the discharging device is positioned at an exit of the conveying path, and the pushing device pushes the sheet to the discharging device when the rear end of the sheet leaves the conveyor. Thus, the difference between the conveying speed of the conveyor and the discharging speed of the discharging device is eliminated. Accordingly, the sheet is hardly scratched.

Further, the pushing device shifts between the push position and the retracting position, and until the rear end of the sheet leaves from the sheet conveyor, the sheet does not contact to the discharging device. Accordingly, the sheet is smoothly discharged with a uniform nip force.

After the sheet passes the sheet conveyor, the sheet is pushed to the sheet discharging device by the pushing device, and nipped at a uniform nip force between these means. Thus the sheet is smoothly discharged at the high speed.

The discharging device has the drive roller whose the periphery is retracted in a middle portion. Accordingly when the pushing device swings to the push position, the sheet is easily received by the drive roller, and the irregular discharging of the sheet is prevented.

The conveyor is the convey roller pair, one roller of the conveying roller pair is a protruding roller whose periphery has a protruding middle portion, and another roller is a retracting roller whose periphery has a retracting middle portion corresponding to the shape of the protruding roller. The sheet is curled to have a gutter-like shape. Accordingly,

the rigidity of the sheet becomes higher, and pushing device can be easily swung to the retracting position.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and advantages of the present invention will become easily understood by one of ordinary skill in the art when the following detailed description would be read in connection with the accompanying drawings:

Figure 1 is a schematic diagram of a printer processor including a sheet discharging apparatus of the present invention;

Figures 2A, 2B are explanatory views illustrating a situation of dispensing sheets with the sheet dispenser;

Figure 3 is a perspective view from the side of an exit of the sheet discharging apparatus;

Figure 4 is a perspective view from another side of the sheet discharging apparatus;

Figure 5 is a side view of the sheet discharging apparatus;

Figure 6 is a plan view of a conveyer roller pair for forming curl;

Figure 7 is a plan view of a friction juncture section;

Figures 8A-8D are explanatory view illustrating a movement when the sheet is conveyed toward the high speed discharging roller.

PREFERRED EMBODIMENTS OF THE INVENTION

As shown in FIG. 1, a printer processor 2 is constructed of a printer section 3 and a processor section 4. The printer section 3 is constructed of magazines 5,6, a cutter 7, a back printer 8, an exposure device 9, and a sheet dispenser 10. The magazines 5,6 respectively contain rolls of color photographic

papers (hereinafter, papers) 11,12 having different width. When a feed roller 13 rotates, the paper 11 is drawn from the magazine 5, and the cutter 7 cuts the paper 11 in accordance with a print size to obtain a cut sheet paper, for example, an L-size sheet (width 89 mm × length 127 mm), a 2L-size sheet (width 127 mm×length 178 mm). When a feed roller 14 rotates, the paper 12 is drawn from the magazine 6, and the cutter 7 cuts the paper 12 in accordance with a print size to obtain the cut sheet paper, for example, an A4-size sheet (width 210 mm×length 297 mm). Usually, when an order of the printing is made in the photofinisher, one of the print sizes of the sheets is selected such that the development may be effectively performed. Accordingly, the change of the print size is usually made corresponding to that of the order. Further, there are several print sizes in one order of the printing. In this case, the printing of the sheet of the same print size is continuously made.

In the back printer 8, necessary information, such as a frame number, a correction data and the like, is printed on the rear surface of the sheet 16,17. In the exposure device 9, a laser printer, digital video printer or the like already known is contained, and an exposure of the sheet 16, 17 is made on the basis of the image data sent from an image reading device, or that memorized in a image data memory provided in the exposure device 9.

As shown in FIGs.2A-2C, the sheet dispenser 10 dispenses the sheets 16 as a small size sheet (89×127mm) and the sheet 17 as the large size sheet (210×297mm) into one or plural rows in accordance with the sheet size. In this situation, each sheet 16, 17 is sent to a processing device or development/fixation device 18 and the dryer 19.

As shown in FIG.2A, the sheets 16 dispensed by the sheet dispenser 10 are arranged zigzag, or in a regularly offset state in two rows on first-third paths 21-23. At first the one sheet 16 is dispensed so as to be on the first and two paths 21, 22, and thereafter the another sheet 16 is dispensed so as to be on the second and third paths 22, 23 behind with difference of a half of the length of the one sheet 16. The dispensation is repeated to arrange the sheets 16 zigzag in two row on the first-third paths 21-23.

As shown in FIG. 2B, the sheet 17 is not sorted but deposited and conveyed in one row on all over the first-third paths 21-23.

In this embodiment, the sheet size of each small and large size sheet is not restricted in the above description. The sheet having the width at least 89 mm and at most 152 mm and the length of at least 82.5 mm and at most 254 mm is regarded as the small size sheet. The sheet having the width more than 152 mm or the length more than 254 mm is regarded as the large size sheet. However, in the present invention, the determination and the sort of the sheet size are not restricted in them. Further, the sheets having a peculiar sheet size, for example, a test print paper for management of exposure, a splice sheet which is cut off from the spliced paper, are regarded as the sheet 17. Further, after the magazines 5, 6 are set, an front end or downstream end of the paper is cut off and conveyed. However, the front end is not used as a product for the photo print. Accordingly the front end is also conveyed with the same manner as the large size sheet.

After being dispensed in one or plural rows by the sheet dispenser 10, the sheets 16, 17 are conveyed to the development/fixation device 18 and the dryer 19 with keeping

the arrangement pattern provided at dispensation.

As shown in FIG. 1, the processor section 4 is constructed of the development/fixation device 18, the dryer 19, a sheet discharging apparatus 25, and a sorter machine 26 (see, FIG.3). The development/fixation device 18 is provided with a developing tank 28, a bleaching/fixing tank 29 and a washing tank group 34, which hasfirst-fourth washing tanks 30-33 in this order from the upstream side of the convey of the sheets 16, 17. The developing tank 28, the fixing tank 29 and the washing tanks 30-33 respectively contain a developing liquid, a fixing liquid and a washing water at a predetermined amount. The sheets 16, 17 are conveyed through the developing, fixing and washing tanks 28-33 with a drive of a conveying rack provided in the developing, fixing and washing tanks 28-33, such that the development is performed. Note that submerged nipping devices are provided in the first-fourth washing tanks 30-33 through which the sheets 16, 17 are conveyed horizontally. The conveying rack may have the squeezing devices outside between the developing and the fixing tanks 28, 29.

The dryer 19 is disposed above the tanks 28-33, and constructed of a conveying belt and an air blowing duct (not shown). The air blowing duct feeds towards the conveying belt an air heated by a heater, so as to press each sheet to the conveying belt. In this situation that each sheet is conveyed on the conveying belt, each sheet is dried. The dried sheet is thereafter conveyed to the sheet discharging apparatus.

As shown in FIGs. 3-5, the sheet discharging apparatus 25 is constructed of a sorting device 36 and a reversibly conveying device 37, or transferring device and controlled by a system controller 38. The sorting device 36 includes a main body 43 having side plates 41, 42. In the main body 43, there

are a primary conveying path 44 and a secondary path 45. Note that the main body 43 has an upper plate for covering the inside of the main body 43, actually. However the upper plate is not illustrated for easiness of FIGs. 3, 4.

The main body 43, as shown in FIG. 5, has an entrance 46 in a lower surface and an exit 47 in an upper surface. The sheets 16, 17 which are conveyed in the passages 21-23 from the dryer 19 enter the main body 43 through the entrance 46, and the sheet 16 exits from the main body through the exit 47. Further, there is an exit 48 for discharging out the sheet 17 at a position below the exit 47.

In the primary path 44, there are first-third conveying roller pairs 49-51, a push frame 52, a high speed discharging roller 53 between the entrance 46 and the exit 47. The primary path 44 is directed upwards near the entrance 46, and curves so as to extend horizontally. The sheets 16 are discharged in a horizontal direction from the exit 47 to the reversibly conveying device 37.

The first-third convey roller pairs 49-51 are arranged such that the primary path 44 may gradually curve from the upside to the horizontal direction, and the sheets 16 are conveyed at the third convey roller pair in a direction inclined to the horizontal direction. The high speed discharging roller 53 is positioned at an exit of the primary path 44. Further, a conveying guide 54 is disposed among the first - third convey rollers from the entrance 46 to the exit 47 around the primary path 44, such that the fornt edge of the sheet 16 conveyed from the upstream side in the primary path 44 may be guided to the convey roller pairs 49-51 downstream of the sheet.

Each of the first and second convey roller pairs 49, 50 is constructed of a drive roller 56 and a nip roller 57. The

drive roller 56 and the nip roller 57 are attached to a metallic driving shaft 56a and a metallic driven shaft 57a. Both end portions of each driving and driven shaft 56a, 57a are supported by the side plates 41, 42. The drive roller 56 may be formed from rubber and have a pillar shape. The nip roller 57 is formed from a synthetic polymer so as to have the almost same shape as the drive roller 56.

As shown in FIG. 6, the third conveying roller pair 51 for forming curl, is constructed of a pair of a nip roller 59 and a drive roller 60. The nip roller 59 is positioned in upper side of the primary path 44, and attached to a metallic driven shaft 59a. The nip roller 59 has a projecting portion 59b which is projected in a middle of a periphery for contacting the sheets 16.

The drive roller 60 is positioned in a lower side and attached to a metallic driving shaft 60a. The drive roller 60 has in a middle of a periphery a retracting portion 60b which is retracted so as to confront to the nip roller 59. As described below, the third convey roller pair 51 nips and conveys the sheet 16 so as to provide it with a curl shape having an arc shape in accordance with the shape of the protruding portion 59b and the retracting portion 60b. While the sheet 16 is conveyed in the primary path 44, a photosensitive layer is positioned in upper side, and as emulsion contained in the photosensitive layer of the sheet 16 is dried, the photosensitive layer shrinks. Accordingly, the nip of the third convey roller pair 51 can easily provide the curl for the sheet 16.

One of the end portions of each driving shaft 56a, 60a in the first-third convey roller pairs 49-51 is protruded from the side plate 41, and has a timing pulley 63 fixed thereto. A loop of a timing belt 66 mechanically combines the plural

timing pulleys 63 with a pinion integrally formed with the driving shaft 64. Further, the driving shaft 64 is connected through a pin clutch with a motor 67 as a source of a drive force. Accordingly, the drive force of the motor 67 is transmitted to rotate the driving shaft 64, and then the rotation of the driving shaft 64 is transmitted through the timing belt 66 to simultaneously rotate the drive rollers 56, 60.

The nip rollers 57, 59 respectively paired with the drive rollers 56, 60 are idly rotatable, and contacted to the drive rollers 56, 60 to rotate corresponding to rotation of the drive rollers 56, 60. Since the drive rollers 56, 60 and the nip rollers 57, 59 are respectively paired as described above, the nip rollers 57, 59 rotate corresponding to rotation of the drive rollers 56, 60, and the sheet 16 is nipped between the drive rollers 56, 60 and the nip rollers 57, 59 and conveyed in the primary path 44.

The high speed discharging roller 53 disposed near the exit 47 of the primary path 44 has plural rubber rolls 71 having a large diameter. The rubber rolls 71 are attached at a predetermined interval to a metallic driving shaft 70. Both end portions of the driving shaft 70 are supported by side plates 41, 42. One of the end portions of each driving shaft 70 is protruded from the side plate 41, and has a pinion 72 fixed thereto. The pinion 72 is meshed with a gear 73 having a larger diameter. A rotational speed of the gear 73 is variable through a pin clutch, a speed changer and the like. The rotation of the gear 73 is controlled such that the rotational speed may be the same between the gear and each drive roller 56, 60. Further, as the pinion 72 has the smaller diameter than the gear 73, the speed of rotation of the pinion 72 is higher than that of the gear 73. Therefore, the high speed discharging roller 53 rotates

at higher speed than the drive rollers 56, 60. Between the high speed discharging roller 53 and the drive roller 60 is further disposed a stationary guide plate 74 extending in a horizontal direction.

As shown in FIG. 7, a periphery 71a of the rubber roll 71 contacts to the sheet 16 and a middle of the periphery retracts in accordance with the curled shape of the sheet 16 that is provided by the third convey roller pair 51.

The push frame 52 as a pushing means is positioned above the high speed discharging roller 53, and constructed of a swingable guide plate 75 and a push roller 76 supported at an end of the swingable guide plate 75. The push roller 76 is constructed of a metallic shaft 76a and a rubber roll 76b which has a large diameter and is firmly attached to the metallic shaft 76a. The shaft 76a is rotatably attached to the end of the swingable guide plate 75.

The swingable guide plate 75 is supported with the driven shaft 59a which constructs the third convey roller pair 51, and has a plate-like shape which extends upward from the driven shaft 59 above the high speed discharging roller 53. The swingable guide plate is movable between a push position (illustrated with a solid line in FIG. 5) and a retracting position (illustrated with a chain double-dashed line in FIG. 5). At push position, the push roller 76 pushes the sheet 16 to the high speed discharging roller 53, and the retracting position, the push roller 76 leaves from the high speed discharging roller 53. The swingable guide plate 75 is usually positioned in the push position by the gravity. In the push position, the sheet 16 is pushed by the weight of the swingable guide plate 75 to contact to the high speed discharging roller 53, and nipped between the push roller 76 and the high speed

discharging roller 53. Accordingly, the high speed discharging roller 53 rotates to discharge the sheets 16 in horizontal direction through the exit 47. Note that the guide plate 75 may be provided with a spring having a weak biasing force, so as to bias to the push position.

The secondary path 45 divides from the primary path 44 at a path exchanger 78, and extends toward the exit 48. The secondary path 45 is provided with plural conveying roller pairs 79, 80 between the path exchanger 78 and the exit 48. The convey roller pairs 79, 80 are arranged in line on the secondary path 45. The convey roller pairs 79, 80 have the same structure as each first and second convey roller pair 49, 50. As shown in FIG. 5, a timing pulley 81 is firmly provided on one end of each shaft to which drive rollers of the convey roller pairs 79, 80 are attached. A timing belt 84 surrounds and contacts the plural timing pulleys 81, a pinion integrally formed with the drive shaft 82. Further, the driving shaft 82 is connected with the motor 67 in the same manner as the driving shaft 64. Accordingly, the drive force of the motor 67 is transmitted to rotate the driving shaft 82, and then the rotation of the driving shaft 82 is transmitted through the timing belt 84 to simultaneously rotate the drive rollers.

The path exchanger 78 effectively exchanges the conveying path between the normal and particular paths 44, 45, when a guide member 84 of the path exchanger 78 is driven by a solenoid 86. The guide member 85 has a first guide surface 85a for guiding to the primary path 45 and a second guide surface 85b for guiding to the secondary path 45.

When the sheet 16 dried in the dryer 19 is supplied through the entrance 46 into the sorting device 36, the sheet 16 is guided to the primary path 44. When the sheet 17 is supplied through

the entrance 46 into the sorting device 36, the sheet 17 is guided to and conveyed on the secondary path 45. Thereafter, the sheet is discharged through the exit 48, and gathered in a tray 126 fixed to the processor section 4.

The sheet 16 conveyed to the primary path 44 is discharged through the exit 47 to the reversibly conveying device 37 by the high speed discharging roller 53. The reversibly conveying device 37 is disposed next to the exit 47, and constructed of a receiver unit 87 and a transferring unit 88 so as to reverse the sheet 16 between front and rear surfaces thereof.

The receiver unit 87 has a wide endless belt 90 and first and second rollers 92, 94. The first and second rollers 92, 94 contact to an inner side of the endless belt 90. The first rotational roller 92 has a relatively small diameter. The first roller 92, whose both ends are rotatably supported, is disposed in an upstream side in the conveying direction C of the reversibly conveying device 37. Further, the second roller 94 has a relatively large diameter, and rotatably disposed in another side of the first roller 92, namely in a downstream side in the conveying direction C. Accordingly, when the first and second rollers 92, 94 rotate, the endless belt 90 shifts on the loop to convey the supplied sheet 16 in the conveying direction C perpendicular to the conveying direction in the sorting device 36.

Both ends of the second roller 94 are rotatably supported by a frame (not shown) of the reversibly conveying device 37. One of the ends is protruded on an outer surface of the frame, and connected with a drive motor (not shown) as a source of a drive force. As the drive motor, there is a pulse motor whose rotational speed is controlled by the system controller 38. Thus the rotation of the motor is transmitted through the second

roller 94 to the endless belt supported by the first and second rollers 92, 94, and the endless belt 90 shift around on the loop formed with support of the first and second rollers 92, 94.

The pulse motor used as the drive motor is, for example, a type which is a changeable variation of a phase excitation type, and rotates 0.9 degree of angle per one pulse.

The transferring unit 88 includes plural thin and narrow belts 102, 104, 106, 108 which are arranged in parallel to construct a conveying path. These plural belts 102, 104, 106, 108 (whose number is four in this embodiment) are supported by first-third rollers 110, 112, 114. The first roller 110 is disposed in right and upper side from the second roller 94 of the receiver unit 87, the second roller 112 is disposed in a left and lower side from the second roller 94, and the third roller 114 is disposed in a lower side from the first roller 92 of the receiver unit 87 at the exit of the sorting device 36.

The first roller 110 has a shaft 118 whose both ends are supported with the frame. Crown rollers are firmly fitted in respective grooves which are formed on a periphery of the first roller 110 at positions corresponding to the four belts 102, 104, 106, 108. Thus the crown rollers rotate at the same rotational speed of the shaft 118. Further, the second and third rollers 112, 114 have respective shafts 120, 122 supported with the frame and crown rollers at positions corresponding to the belts 102, 104, 106, 108 on the shafts 120, 122. The crown rollers are fixed to the shafts 120, 122, so as to rotate at the same rotational speed of the shafts 120, 122.

Each of the belts 102, 104, 106, 108 forms a loop around on the supporting first-third rollers 110, 112, 114. Each belt 102, 104, 106, 108 is pressed to contact to the first roller

110 such that the each belt 102, 104, 106, 108 turns about 180 degrees with the center of the first roller 110. Thereafter, the each belt turns to an opposite direction with the contact to the third roller 114, and then contacts to the second roller 112 to be bent towards the first roller 110 for an endless form. Thus the conveying path of the sheet 16 is constructed.

When the sheet 16 is discharged through the exit 47 to the reversibly conveying device 37, the endless belt 90 of the receiver 87 continuously moves. Therefore, the discharged sheet 16 is positioned on the moving endless belt 90, and conveyed. Thus the sheets 16 discharged from the sorting device 36 are arranged in one row and sequentially conveyed in the conveying direction C. Then the sheets 16 are sandwiched between the endless belt and the belts 102, 104, 106, 108, and discharged from the upper to the lower side of the second roller 94. Thus the sheets 16 are turned over. Thereafter, the sheet is conveyed on the belts 102, 104, 106, 108 in the direction B, and supplied through a space between the first roller and the third roller 114 to a tray 124 of the sorter 26.

The sorter 26 in which the sheets 16 are supplied from the reversibly conveying device 37 has plural trays 124 which are attached to a shifting means for shifting around on a loop. The trays 124 are sequentially shifted downward from the receiving position at the exit of the reversibly conveying device 37, and turned at the lowermost position to shift to the receiving position. The sheets 16 are discharged through the exit between the first roller 92 and the roller 114, and received by the tray 124 positioned at a receiving position in the lower side of the exit. When the supply of the sheets 16 of the one customer order on the tray 124 is completed, a sort signal is generated, and the tray 124 is shifted downward for one stage,

and another empty tray 124 is shifted from an upper side to the receiving position so as to receive the sheets 16 of the another customer order. The sheets 16, 17 disposed on the tray 124 after the completion of the supply thereof are removed from the tray 124 by an operator while the tray 124 is shifted to an lowermost position.

Effects of the above structure will be explained now. Note that the sheet 16 is taken as an example in the following explanation. When the explanation of the sheet 17 is necessary, they are taken an example.

The printer processor is turned on, and the operator inputs image recording information, such as image data of images to be printed on the recording paper 11, the print size, the number of photo prints and the like. Then a print start button is pressed to start the recording processes of the image on the paper 11. Then, the paper 11 is drawn from the magazine 5, and cut by the cutter 7 to produce the sheet 16. Then the sheet 16 is conveyed sequentially through the back printer 8 and the exposure device 9, in which the printing on the back surface and the exposure of the printing surface of the sheet 16 are respectively made. After the print on the back and recording surfaces is completed, the sheet 16 is conveyed to the sheet dispenser 10.

In the sheet dispenser 10, the sheets 16 are arranged in zigzag on two rows on the basis of predetermined dispensing pattern, and further conveyed in this arrangement to the processing device development/fixation device 18 and the dryer 19.

In the development/fixation device 18 and the dryer 19, the developing treatment and the drying treatment of the sheet 16 are made. Thereafter, the sheet 16 is conveyed to the sheet

discharging apparatus 25. In the sheet discharging apparatus 25, as mentioned above, the sheet 16 is conveyed in the primary path 44 and discharged through the exit 47 to the endless belt 90. The process for discharging the sheet 16 from the primary path 44 to the endless belt 90 is explained in reference with FIGs. 8A-8C.

In FIG. 8A, the sheet 16 is conveyed toward the nip roller 59 by rotation of the first-third conveying roller pairs 49-51, in the conveying path curved by the conveying guides 54. As shown in FIG. 8B, the convey direction at the third convey roller pair 51 is inclined with the inclination angle α to the perpendicular direction. Thereby as nipped with the third convey roller pair 51, the sheet 16 is provided with the curl having the gutter-like shape. The sheet 16 having the gutter-like curl has a high rigidity in the conveying direction. Accordingly, a front end or downstream end 16a of the sheet 16 pushes up the swingable guide plate 75, which is shifted from the push position to the retracting position.

The sheet 16 is further conveyed with the inclination of the angular α to press the swingable guide plate 75 while nipped by the third convey roller pair 51. Then as shown in FIG. 8C, a rear end or upstream end 16b of the sheet 16 reaches the third convey roller pair 51.

The sheet 16 discharged by the third convey roller pair 51 cannot keep the swingable guide plate 75 in the retracting position. Accordingly, as shown in FIG. 8D, the swingable guide plate 75 swings back to the push position by its own weight to push the sheet 16 to the high speed discharging roller 53, and the high speed discharging roller 53 rotates to discharge the sheet 16 in the horizontal direction through the exit 47 to the endless belt 90. Thereby, as the periphery 71a of the rubber

roll 71 constructing the high speed discharging roller 53 has a retraction in accordance with the form of the curl of the sheet 16, the high speed discharging roller 53 can receive the sheet 16 to prevent the irregular discharging of the sheet 16. Therefore, the next sheet 16 conveyed in another row is discharged at the predetermined interval after that in the preceding row. Thus the discharging out of the sheets 16 through the exit 47 is made in the order of the zigzag arrangement. Further, the sheets 16 are conveyed in one row on the endless belt 90 and the belts 102, 104, 106, 108 toward the tray 124 of the sorter machine 26. In the sorter 26, the sheets 16 are sequentially overlaid and gathered on the one tray 124 for each customer order.

Thus the sheet 16 conveyed by the first - third convey roller pairs 49-51 is pushed by the push frame 52 and discharged to the endless belt 90. Accordingly, when the third convey roller pair 51 and the high speed discharging roller 53 are positioned at a smaller interval than the length of the sheet 16 in the conveying direction, it is not necessary to provide a one-way clutch for absorbing the difference between the conveying speed of the third convey roller pair 51 and the discharging speed of the high speed discharging roller 53, and the cost for production becomes lower. Further, as the slip between the rollers and the sheet does not occur, the pollution and the abrasion are prevented. Thus the sheet 16 can be discharged with a stable nip force, and the maintenance can be kept more easily.

Further, the sheet is conveyed with the inclination by the third convey roller pair 51 to swing the swingable guide plate 75 in the retracting position. Therefore before the rear end 16b of the sheet 16 leaves the third convey roller pair 51,

the sheet 16 does not contact to the high speed discharging roller 53. Accordingly, the sheet 16 is not scratched and the discharging speed of the high speed discharging roller 53 can be kept for stable conveyance.

Note that the roller members are fixed to the shaft in the conveying roller pair and the high-speed discharging roller of the above embodiment. However, the present invention is not restricted in it, and the roller members may be slidable along the shaft. In this case, the position of the roller member is adjusted in accordance with the width of the sheet and the number of the rows in the conveying path.

In the above embodiment, the photosensitive material drawn from the magazine is cut by the cutter 7 to have a predetermined size. The position of the cutter 7 may be upstream from the sheet dispenser 10, and is not restricted in the above embodiment. Further, the cutting direction of the cutter 7 is a widthwise direction of the photosensitive material, and the print size of the cut sheet depends on the length of convey before cutting. Further, in the above embodiment, the width of the print size in the widthwise direction is changed by selecting one of the plural photosensitive materials which have different width. However, a slitter may be provided so as to cut the photosensitive material in the conveying direction, and to change the width of the cut recording material. The number of the magazines is not restricted in two, but may be equal to or than three.

Further, in the above embodiment, the sheets 16 conveyed in two rows are discharged and aligned in one row. However, the present invention is not restricted in this embodiment, and the sheet may be conveyed with arrangement in at least 3 rows. In this case, the convey roller pairs 49-51, the push frame 52,

the high speed discharging roller 53 are disposed on each row.

In the above embodiment, the present invention is applied to a device for developing the photosensitive material. However, the present invention may be applied to multi-row types of sheet discharging apparatus in which sheets in plural rows are conveyed. For example, the present invention may be applied to an ink jet printer, in which the sheet after printing is conveyed and dried in plural rows.

Various changes and modifications are possible in the present invention and may be understood to be within the present invention.